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MORRISON & FOERSTER LLP 1650 TYSONS BOULEVARD SUITE 300 MCLEAN, VA 22102			ALEJANDRO, RAYMOND	
			ART UNIT	PAPER NUMBER
			1745	

DATE MAILED: 02/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/891,200

Applicant(s)

SMOTKIN, EUGENE S.

Examiner

Raymond Alejandro

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-74 is/are pending in the application.
- 4a) Of the above claim(s) 2,4-30,34-43,45 and 47-68 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,31-33,44,46 and 69-74 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 10/09/03.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## **DETAILED ACTION**

### ***Response to Amendment***

This office action is responsive to the amendment filed 11/25/03. The applicant has overcome the objections and some of the art rejections (the 35 USC 102 over Crome et al'113 and the 35 USC 103 rejection over Deublein et al) . Refer to the abovementioned amendment for specific details on applicant's rebuttal arguments. However, the instant claims (including newly submitted claims 69-74) are finally rejected as other art rejections still stand for the reasons of record.

### ***Election/Restrictions***

1. This application contains claims 2, 4-30, 34-43, 45, 47-62 and newly submitted claims 63-68 drawn to an invention nonelected with traverse in Paper No. 07/23/03. A complete reply to the final rejection must include cancelation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.
2. Newly submitted claims 63-68 directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: *(as admitted by the applicant)* new claims 63-68 are supported by original claim 61, it is thus noted that original claim 61 correspond to a non-elected invention which was originally withdrawn from consideration.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 63-68 are also withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

***Information Disclosure Statement***

3. The information disclosure statement (IDS) submitted on 10/09/03 was considered by the examiner.

***Claim Rejections - 35 USC § 102***

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1, 3, 31-33, 44, 46, 69-70 and 72-73 are rejected under 35 U.S.C. 102(b) as being anticipated by the publication "Solid-State protonic conductors: principles, properties, progress and prospects" by T.Norby (hereinafter referred to as "the Norby's publication").

The present application is directed to an electronically insulating proton conductor wherein the disclosed inventive concept comprises the specific working temperature. Other limitations include the specific substrate material.

With respect to claims 1, 3, 44 and 46:

The Norby's publication teaches a solid-state protonic conductor (TITLE) which can be used in a fuel cell as a hydrogen permeable membrane (ABSTRACT). It is disclosed that protonic conductivity are candidates for electrolyte in fuel cells (INTRODUCTION). Norby discloses protonic conductors are electrolyte in which hydrogen is transported towards and evolved at the cathode. It is further disclosed that protonic transport includes transport of protons and any assembly that carries protons and/or proton exchange membranes (PEM) (Sections: 2. Principles of Protonic Conduction-Classes of Proton Conductors, & 4.1 Water-containing Systems: PEMs).

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It is also disclosed that in solids, vehicle mechanisms are usually restricted to materials with open structures (channels/layers) to allow passage of the large ions and molecules (Section: 2. Principles of Protonic Conduction-Classes of Proton Conductors). *Hence, it is asserted that the very open structure of the solid proton conductor does provide the conducting support, that is, the open structure or layer itself forms the conducting support as Norby's teachings encompass the formation of several structures such as: i) open structures, ii) solid protonic conductors having liquid or liquid-like regions or layers of waters such as hydrates where adsorbed hydrous layers on each grain provide the proton conductive medium and/or membrane, iii) crystallographically fixed protons requiring the formation of defects such as proton vacancies or interstitials, or iv) materials in which protons are not part of the nominal structure but are present as foreign species like specific defect structures and v) lattices and sublattices* (Section: 2. Principles of Protonic Conduction-Classes of Proton Conductors). *Accordingly, the proton conductor is supported on an electronically conducting support including water-mediated transport, crystallographic proton transfer via proton acceptor and donor sites or vacancies and interstitials, and as defect protons in nominally proton-free compounds* (Section: 2. Principles of Protonic Conduction-Classes of Proton Conductors).

The Norby's publication specifically teaches they investigated the proton conductivity of  $\text{SrHPO}_4$ ,  $\text{Sr}(\text{H}_2\text{PO}_4)_2$ ,  $\text{Ba}(\text{H}_2\text{PO}_4)_2$  and di-hydrogen phosphates in the temperature range of 320 °C (Section: 4.2 Low-Temperature inorganic proton conductors); it is also disclosed the doped oxides and phosphates are decent proton conductors from 5-600 °C (Section: 3. Properties). The Norby's publication acknowledges the use of such proton conductors for both chemical

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processes and energy conversion process (Section: 3. Properties). Thus, Norby's publication shows sufficient specificity with respect to the temperature range.

*Thus, the electronically insulating and energy converting properties are inherent to the protonic conductor material per se. Accordingly, products of identical chemical composition cannot have mutually exclusive properties, and thus, the claimed property i.e. capable of converting chemical energy as well as being electronically insulating, is necessarily present in the prior art material. Thus, the proton conducting materials convert chemical energy of a reaction into electrical energy at the claimed (i.e. a temperature of about 220-550 °C.*

The Norby's publication shows in **Figure 1** an overview of proton conductivities for selected materials as a function of temperature (FIGURE 1). The plot illustrates data for proton conductivity as a function of inverse temperature wherein 1) BCN 18, 2) BYSO, 3) Y:BaCeO<sub>3</sub>, 4) Y:BaZrO<sub>3</sub>, 5) CsHSO<sub>4</sub>, 6) IISAP, 7) H<sub>3</sub>PO<sub>4</sub> are suitable protonic conductors under working temperatures (inverse temperature) ranging from 0.0018 to .0045 T<sup>-1</sup> (equivalent to approximately 220-550 °C) (SEE FIGURE 1). Thus, the proton conducting materials convert chemical energy of a reaction into electrical energy at the claimed (i.e. a temperature of about 220-550 °C.

With respect to claim 31:

The Norby's publication reveals that Ba<sub>3</sub>Ca<sub>1.18</sub>Nb<sub>1.82</sub>O<sub>8.73</sub> (BCN18) shows proton conduction (Section: 3. PROPERTIES).

As to claims 32-33:

Norby reveals that a metal hydride can be used with a solid polymer electrolyte in fuel cells and prototype fuel cells (Section: 5. Prospects - 5.1 Systems with proton-conducting

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electrolytes-hydrogen as an energy carrier). It is also disclosed that palladium is an established material in hydrogen permeable membranes (SECTION: 5.2 Hydrogen Separation Membranes: mixed protonic-electronic conductors). *Thus, Norby's teachings encompasses the use of the metal hydride and palladium in hydrogen membranes.*

As to claim 69 and 72:

It is disclosed the use of hydrate  $\text{CsHSO}_4$  (SECTION: 2. Principles of Protonic Conduction- Classes of Proton Conductors/ FIGURE 1); and  $\text{SrHPO}_4$ ,  $\text{Sr}(\text{H}_2\text{PO}_4)_2$ , and  $\text{Ba}(\text{H}_2\text{PO}_4)_2$  (SECTION: 4.2 Low-Temperature inorganic proton conductors)

As for claim 70 and 73:

It is disclosed water-containing materials comprising organic and inorganic hydrates (SECTION: 2. Principles of Protonic Conduction- Classes of Proton Conductors).

*Examiner's Note: As to the specific preamble reciting "of a membrane electrode assembly", it is pointed out that the preamble refers to intended use. That is, the claim is directed to a proton conductor/conducting composite membrane and the foregoing preamble phrase is only a statement of ultimate intended utility.*

Thus, the claims are anticipated.

6. Claims 1, 3, 44 and 46 are rejected under 35 U.S.C. 102(e) as being anticipated by Hsu 6083636.

With respect to claims 1, 3, 44 and 46:

Hsu disclose a fuel cell system for producing electricity having operating temperatures in the range between about 20 °C and about 2000 °C. It is disclosed that the fuel cell can have

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multiple temperature regions formed axially along the stack (ABSTRACT/COL 3, lines 55-63/COL 14, lines 19-30). Hsu discloses that the fuel cell stack can be a proton exchange membrane fuel cell (COL 3, line 65 to COL 4, line 5). *That is, the fuel cell stack employs a proton exchange membrane material as the electrolyte.* It is further disclosed that the fuel cell stack includes a plurality of electrolyte plates (COL 4, lines 6-10). Hsu reveals the use of fuel cell stacks composed of materials suitable for operation at different temperatures (col 4, lines 46-65) wherein, in one aspect, the fuel cell stacks comprises multiple axially adjacent temperature regions along the stack such that each region operates at a different operating temperature (COL 4, line 65 to COL 5, line 5).

[57]

## ABSTRACT

A system and method for producing electricity with a fuel cell power system. The power system includes an assembly of fuel cell stacks that operate at different temperatures, which vary between two or more of the fuel cell stacks. The fuel cell stack can have multiple temperature regions formed axially along the stack, or a plurality of spatially separated fuel cell stacks can be employed to heat a reactant from an input temperature to a desired temperature. The fuel cell stacks have operating temperatures in the range between about 20° C. and about 2000° C.

It is disclosed that the fuel cell has electrolytes (Col 8, lines 40-55/ COL 19, lines 24-35):

The performance of each temperature region of the fuel cell stack can be maximized by forming each section of a material suitable for use at the operational temperature of the region. Exemplary electrolyte materials suitable for use in  
45 such a wide temperature range include solid state or solid oxide materials including yttria stabilized zirconia, lanthanum gallate, ceria based oxide, bismuth based oxide, or composites of any one of the foregoing materials; and exemplary fuel cell types include solid oxide or solid state fuel  
50 cells, molten carbonate fuel cells, phosphoric acid fuel cells, alkaline fuel cells, and proton exchange membrane fuel cells. The portion of the fuel cell defined by each temperature section operates at a selected temperature, and hence has an associated suitable electrolyte material. Those of  
55 ordinary skill will readily recognize which of the foregoing materials are best suited for a particular temperature range.

According to one embodiment, fuel cells having different operating temperatures are aligned in a sequence of increasing temperature wherein the operating temperature of the fuel

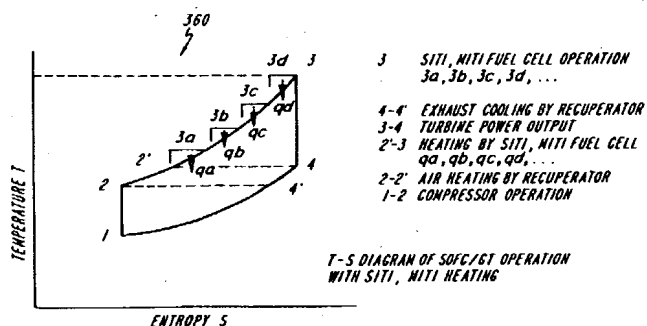


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cell is between about 20°C and about 2000 °C, and the preferred fuel cell types include proton membrane fuel cells (Col 14, lines 55-67).

55 According to another embodiment, fuel cells having different operating temperatures are aligned in a sequence of increasing temperature. The operating temperature of the fuel cell is between about 20° C. and about 1500° C., and the preferred fuel cell types include proton membrane fuel cells, phosphoric acid fuel cells, alkaline fuel cells, molten carbonate fuel cells, and solid oxide fuel cells, or solid state fuel cells, which can be composed of yttria stabilized zirconia, lanthanum gallate, ceria based oxide, bismuth based oxide, or composites of anyone of the foregoing materials, all  
60 arranged in an ascending temperature order. FIG. 6 illustrates the use of an assembly of fuel cells, A, B, C, D of different operational temperatures. The illustrated graph 360

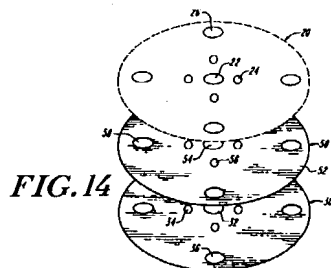
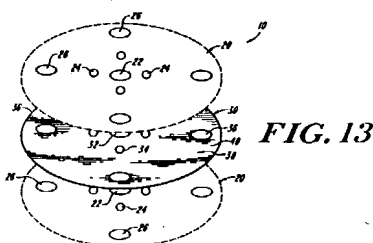
**Figure 6** below illustrates the use of an assembly of fuel cells A, B, C, D at different operational temperatures. The illustrated graph 360 denotes entropy S along the abscissa and temperature T along the ordinate. The power system cycle follows the process states of 1, 2, 2', 3, 4 and 4' (COL 14, line 65 to COL 15, line 15). *Thus, the illustrated graph 360 shows the temperature increases of the fuel cell operation between about 20°C and about 2000 °C. Thus, it is apparent that a temperature range from 220 °C to about 550 °C is illustrated in the graph 360 and therefore, the fuel cell will generate electrical energy at the claimed temperature interval during the sequence of increasing temperature. Thus, Hsu discloses proton exchange membranes generating electrical energy within the claimed temperature range and with sufficient specificity by interpolating the specific temperature values from graph 360 of Figure 6.*

**FIG. 6**

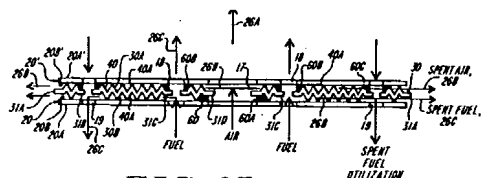
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It is disclosed that each electrolyte plate 20 is typically an ionic conductor having low ionic resistance to allow transport of an ionic species (COL 7, lines 33-38).

Figures 13-15 shows the basic cell unit 10 including an electrolyte plate 20 and an interconnector plate 30 wherein the electrolyte plate 20 can be made of a ceramic material on which a porous oxidizer electrode material 20A and a porous fuel electrode 20B are disposed thereon (COL 19, lines 24-35). It is disclosed that the interconnector plate 30 is made of an electrically conductive interconnect material serving as the electric connector between the adjacent electrolyte plates (COL 19, lines 26-45). It is further disclosed that the a spacer plate 50 can be interposed between the electrolyte plate 20 and the interconnector plate 30 and is made of an electrically conductive material (COL 19, line 65 to COL 20, line 9). Figure 15 illustrates the electrolyte plate 20, and the interconnect plates 30 being alternately stacked and aligned (COL 20, lines 15-20). Thus, it is contended that either the electrically conductive interconnect plate 30 and the electrically conductive spacer plate 50, alone or in combination, act as the claimed electronically conducting support.



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**FIG. 15**

Examiner's Note: since the recited proton conductor material i.e. the proton conductor including a conducting support covers a very large number of applicable materials which can be used therefor, it is also contended that an electrolyte comprising any combination of electrolyte plates and interconnector plates or spacer plates would produce a proton conductor supported on a conducting support exhibiting the specific energy conversion properties.

As to the specific preamble reciting "of a membrane electrode assembly", it is pointed out that the preamble refers to intended use. That is, the claim is directed to a proton conductor/conducting composite membrane and the foregoing preamble phrase is only a statement of ultimate intended utility. Moreover, the electronically insulating and energy converting properties are inherent to the protonic conductor material per se used in the fuel cell.

Hsu further discloses that the fuel cells can be formed of selected materials appropriate for the operational temperatures at which the fuel cell is to operate. The fuel cells suitable for use includes at least solid oxide or solid state electrolytes, molten carbonate electrolytes, phosphoric acid electrolyte, or alkaline electrolyte (COL 12, lines 49-61).

Thus, the proton conducting electrolyte is **capable** of converting chemical energy of a reaction into electrical energy at the claimed (i.e. a temperature of about 220-550 °C) by adequately selecting any of the electrolyte materials mentioned above.

Thus, the claims are anticipated.

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*Claim Rejections - 35 USC § 103*

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. Claims 31, 71 and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu 6083636 as applied to claims 1 and 3 above, and further in view of Crome et al 5985113.

Hsu is applied, argued and incorporated herein for the reasons above. However, Hsu does not expressly disclose the specific proton conductor material.

Crome et al also disclose the following:

As to claim 31:

Crome et al disclose the following (COL 9, lines 10-26):

For all described embodiments, it is envisioned that the electrolyte material can be selected from the following groups and mixtures thereof: 10

5) lanthanum gallate  $\text{La}_{1-x}\text{Sr}_x\text{Ga}_{1-y}\text{Mg}_y\text{O}_3$  where  $(0 < x < 0.30)$  (where  $x=0.10$  is preferred) and  $(0.00 < y < 0.30)$  (where  $y=0.20$  is preferred). 25

Crome et al also envision that the electrolyte material can be selected from a variety of element groups and mixtures thereof including scandium (Sc) (CLAIM 12/ COL 9, lines 10-26).

*Thus, it is asserted that scandium (Sc) can replace gallium (Ga) in the ceramic composite chemical formula.*

In view of this disclosure, it would have been obvious to one skilled in the art at the time the invention was made to use the proton conductor material of Crome et al in the proton conducting material of Hsu as Crome et al teaches that, for all described embodiments, it is envisioned that the electrolyte material can be selected from a variety of groups and mixtures including an alternative use of scandium element (Sc) as this allows the fuel cell stack to operate

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in multiple temperature regions including the claimed temperature range and provides efficiency power systems. Moreover, Crome et al directly teach that scandium (Sc) can be a doping element which might substitute or replace any element in electrolyte composite materials. Further, those of ordinary skill in the art knows that scandium (Sc) element may be a substitute element in composite materials as both elements Sc and Ga shows the same chemical valence.

9. Claims 31, 71 and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over the publication "Solid-State protonic conductors: principles, properties, progress and prospects" by T.Norby (hereinafter referred to as "the Norby's publication") as applied to claims 1 and 3 above, and further in view of the publication "Chemical stability and proton conductivity of doped BaCeO<sub>3</sub>-BaZrO<sub>3</sub> solid solutions" by Kwang Hyun Ryu et al (hereinafter referred to as "the Kwang's publication").

The Norby's publication is applied, argued and incorporated herein for the reasons above. However, the Norby's publication does not expressly disclose the specific proton conductor material.

The Kwang's publication teaches solid solutions such as BaCe<sub>0.9-x</sub>Zr<sub>x</sub>M<sub>0.1</sub>O<sub>3-δ</sub> where M is Gd or Nd and x ranges from 0-0.4 (ABSTRACT). It is disclosed that this composition gives a good compromise between conductivity and stability for fuel cell applications (ABSTRACT).

In light of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the solid composition of the Kwang's publication as the proton conducting material of the Norby's publication because the Kwang's publication teaches this composition gives a good compromise between conductivity and stability for fuel cell

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applications as it has been found that this composite compound exhibits both high conductivity, good stability and an increased in the activation energy for proton transport.

10. Claims 31, 71 and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over the publication "Solid-State protonic conductors: principles, properties, progress and prospects" by T.Norby (hereinafter referred to as "the Norby's publication") as applied to claims 1 and 3 above, and further in view of the publication "Proton and oxide ion conductivity of doped LaScO<sub>3</sub>" by Dorthe Lybye et al (hereinafter referred to as "the Dorthe's publication").

The Norby's publication is applied, argued and incorporated herein for the reasons above. However, the Norby's publication does not expressly disclose the specific proton conductor material.

The Dorthe's publication teaches that conductivity of La<sub>0.9</sub>Sr<sub>0.1</sub>Sc<sub>0.9</sub>Mg<sub>0.1</sub>O<sub>3</sub> has been studied (ABSTRACT), particularly at 400°C (Section: 2. EXPERIMENTAL). It is also disclosed that the conductivity measurements suggests that La<sub>0.9</sub>Sr<sub>0.1</sub>Sc<sub>0.9</sub>Mg<sub>0.1</sub>O<sub>3</sub> is also a proton conductor (Section: 3. RESULTS and DISCUSSIONS).

In light of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the compound of the Dorthe's publication as the proton conducting material of the Norby's publication because the Dorthe's publication teaches that at temperatures below 700°C, proton conduction dominates. Accordingly, the specified compound is a proton conductor showing satisfactory ionic conductivity.

***Response to Arguments***

Applicant's arguments filed 11/25/03 have been fully considered but they are not persuasive.

The main contention of applicant's argument is now premised on the assertion that the prior art of record fails to reveal "the electronically conducting support". In this regard, it is noted that a first prior art reference explicitly shows that in solid protonic conductors, vehicle mechanisms are usually restricted to materials with open structures (channels/layers) to allow passage of the large ions and molecules. Hence, it is asserted that the very open structure of the solid proton conductor does provide the conducting support, that is, the open structure or layer itself forms the conducting support as Norby's teachings encompass the formation of several structures such as: i) open structures, ii) solid protonic conductors having liquid or liquid-like regions or layers of waters such as hydrates where adsorbed hydrous layers on each grain provide the proton conductive medium and/or membrane, iii) crystallographically fixed protons requiring the formation of defects such as proton vacancies or interstitials, or iv) materials in which protons are not part of the nominal structure but are present as foreign species like specific defect structures, and v) lattices and sub-lattices. Accordingly, the proton conductor is supported on an electronically conducting support including water-mediated transport, crystallographic proton transfer via proton acceptor and donor sites or vacancies and interstitials, and as defect protons in nominally proton-free compounds. Furthermore, another prior art reference also teaches the use of interconnector plates and/or spacer plates, to contact, stack and align the electrolyte plate. Thus, it is contended that either the electrically conductive interconnect plate 30 and the electrically conductive spacer plate 50, alone or in combination, act(s) as the claimed

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electronically conducting support. *Having shown two materially and structurally different conducting supports, the examiner contends, at this point and without hesitation, that the prior art of record does indeed provide the necessary structural and functional interrelationship to satisfy the claimed requirement.*

As to the assertion of “converting chemical energy to electrical energy”, the examiner likes to point out that the two individual references reveal the use of proton conductor features for electrochemical generation of energy. To be precise, the Norby’s publication divulges solid state protonic conductors as candidate materials with high and pure protonic conductivity for electrolytes in fuel cell applications, in particular, for both chemical processes and energy conversion processes (Refer to Section: 1. Introduction; Section: 5. Prospects-5.1 Systems with proton-conducting electrolytes-hydrogen as an energy carrier; and Section: 3. Properties). For instance, Hsu discloses a fuel cell stack for producing electricity with the fuel cell power system itself (See abstract). *As a consequence, the very nature of both the Norby’s publication and Hsu’s disclosure encompass and envisage the production of electrical energy through chemical reactions within the claimed temperature range, and therefore, the two references evidently enable skilled artisans to do so. The cited prior art is indicative of the level of ordinary skill and the degree of enablement.* Furthermore, it is noted that although the prior art might fail to disclose some chemical characteristics, in view of the substantially similar proton conducting composite system being disclosed in the prior art, the examiner has a reasonable basis to suspect that the claimed proton conducting material and the prior art’s product would be substantially the same. Since PTO does not have proper equipment to carry out the analytical tests, the burden is then shifted to the applicant to provide objective evidence demonstrating the claimed product is



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necessarily different from the prior art's product, cannot perform as instantly claimed and, if so, that the different is unobvious.

With respect to the statement that "nobody prior to this invention has been successful in converting chemical energy to electrical energy", arguments that the alleged anticipatory prior art teaches away from the invention or is not recognized as solving the problem solved by the claimed invention, are not germane to a rejection under section 102. The question whether a reference "teaches away" from the invention is inapplicable to an anticipation analysis. The prior art has been held to anticipate the claims even though it teaches away from the claimed invention (*See MPEP 2131.05 Nonanalogous Art*). In this case, although the Norby's publication discloses that "there are no solid proton conductors working "satisfactorily" in the gap between, say, 200 and 500°C", the Norby's publication does disclose that conductivity of certain compounds were investigated in the range up to 320°C. Thus, the Norby's publication shows the operating temperatures for both chemical processes and energy conversion within the claimed range and with sufficient specificity. In actual fact, the reason why the Norby's publication arrived into the conclusion that no solid proton conductors work satisfactorily within said gap, it because the proton conductivity of certain solid materials were investigated within said gap but their conductivities were not satisfactory. Thus, even though Norby's solid material did not perform as expected once they were investigated within the specific temperature gap, it might be implied that, to some extent or certain degree, the foregoing solid materials did convert energy at the specified temperature, however, they rate of energy conversion were not satisfactory either for industrial applications, or high power output purposes. It is also noted that applicant's allegation that "nobody prior to this invention has been "successful" in converting chemical

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energy to electrical energy”, one way or another, acknowledges that “*somebody*” prior to this invention was “*unsuccessful*” in converting chemical energy to electrical energy. What is meant by “successful”? How does the applicant define “successful”, with respect to what degree or performance? In view of that, it is asserted that high performance achievements are not absolute requirements in anticipatory basis. Additionally, applicant appears to admit, somehow, the existence of proton conductors having “*poor*” electrochemical energy conversion properties in the claimed temperature range. Thus, since the instant claims are also completely silent as to the specific degree of energy conversion, it is thus believed that solid proton conducting materials exhibiting nominal energy conversion rates still read on the instant claim language and hence, reflect the intended scope of the invention, namely, being able to convert chemical energy of a reaction into electrical energy.

As to the specific preamble reciting “*of a membrane electrode assembly*”, the examiner wishes to state that the foregoing language does not positively and constructively recite a membrane electrode assembly (MEA) structure or embodiment as appears to be argued by the applicant. In this respect, it is noted that applicant is trying to argue that electronically insulating proton conductors represent membrane electrode assemblies and, vice-versa, membrane electrode assemblies stand for electronically insulating proton conductor. As a matter of fact, it is clarified that an electronically insulating proton conductor is any material that is capable of being non-electronically conducting but protonically conducting while a membrane electrode assembly (MEA) is a structural assembly generally including, at least, a membrane and additional components such as electroactive material (e.g. catalyst) on both sides thereof. Certainly, applicant’s attempt to physically-chemically and functionally equate both features (i.e. the proton

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conductor and the membrane electrode assembly) is technically inaccurate. As previously stated, since the instant claims are strictly directed to a proton conductor material per se, the preamble phrase "*of a membrane electrode assembly*" does not impart further structural characteristic and thus, it is considered to be a statement of ultimate intended utility.

### ***Conclusion***

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone numbers for the

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organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Raymond Alejandro  
Examiner  
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A handwritten signature in black ink, appearing to be 'RAYM', with a long horizontal line extending from the end of the signature.